

## **AUTOMATION OF PROCESSES AS A DIRECTION OF ENERGY MANAGEMENT AND ENERGY SAVING IN CITY LIFE SUPPORT SYSTEMS**

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The changes that took place in the structure of energy production in Ukraine, caused by the capture of Europe's largest Zaporizhzhia nuclear power plant by Russian troops, the occupation of the Chornobyl nuclear power plant, and the creation of problems with the supply of energy carriers (coal, gas) to thermal power plants led to a significant decrease in the generation of electricity and thermal energy. These events result in the challenges for heating, electricity supply, and lighting of cities and settlements. It should be mentioned that similar problems have already occurred in other countries as well. In such conditions, priority should be given to energy-saving issues, i.e. the economical use of energy at all stages and levels of its application. For this, first of all, it is necessary to launch a broad campaign on energy saving with the use of moral and material incentive systems, as well as a system of improving the qualifications of personnel engaged in the operation of technical systems in the industry, transport, communal economy as well as in domestic services.

In the well-known works devoted to this issue, the conditions of sustainable development of territories are considered in a simplified form, in particular, within the framework of socio-economic consequences, and in general terms. None of the well-known works focus on the ways of increasing the effectiveness of the territories functioning in extreme conditions, which are the aggressive actions by another state. The aim of the work is to consider the approaches of solving problems mentioned.

Actually, consumers of communal services of city-wide importance are characterized by the most unfavorable impact on the power supply system (PSS). The large value of the unit power of electric receivers in combination with the variety of their operating modes caused a significant influence of communal services' consumers on the parameters of the PSS mode, on the one hand, and complicated their normalization, on the other. Such consuming includes heating, water supply and sewage systems, electric transport, outdoor lighting, television, radio communication, etc. The main trends in the development of public utilities of cities are closely connected with the problems of energy saving and, therefore, foresee a further increase in the unit capacity of installations, as well as an increase in the quality of their control due to the use of modern automated electronic and microprocessor control systems. Thus, as a powerful source of distortions,

communal services' consumers of city-wide importance put forward increased requirements for the quality for energy supply in the PSS.

As the result of assessing the requirements and the current state of the city PSS, it can be noted that, in general, the PSS of the city as an object of control is a complex multi-level developing system having many internal and external connections, speedy and continual changes in the parameters of the technological process of production, transmission and distribution of the electrical energy (EE). The stable operation of such system, operating costs and consumer losses are largely determined by the level of automation of the technological process of parameters' control. In all the variety of the schemes and modes of the operation of the PSS of cities, in the technological scheme of the electricity supply to the consumers, general technological operations can be defined. The performance efficiency of each of the 26 considered operations has a decisive effect on the technical and economic indicators of power supply systems and the power receivers connected to them. The efficiency of the operation on the distribution of EE between individual consumers is the lowest. EE's losses at this stage are now several times higher than its transmission losses. According to the data published, the power loss in the medium and low voltage networks of the USA, England, Germany, Japan, etc. is 8% and 12%, respectively, while power loss in higher voltage networks does not exceed 4%. In Ukraine and some developing countries, the situation is even worse. Power loss in the medium and lower voltage networks reaches 15-20% on average.

The analysis of the causes of the present state indicates that the most important direction of energy saving in the PSS of cities is the improvement of nuclear power plants and increasing the level of compensation of reactive power in them. For a long time in the leading countries of the world (USA, England, France, Germany, Japan) the annual increase in electricity consumption by 5-10% is compensated not by the growth of generating capacities, but by the increase of the efficiency of the technological process at various stages of energy production. The consequence of this is that EE losses in power supply systems are several times lower as well as the technological costs of EE for consumers are also considerably lower than in Ukraine and some other developing countries. The analysis of the current state shows the influence of many factors on the efficiency of the technological processes in the PSS of cities, namely, installation locations, capacity and degree of loading of equipment, schemes and parameters of networks, quality and level of automation of voltage regulation and reactive power compensation processes. The mentioned problems are mostly solved at the stage of prospective and current planning of the network operation modes. However, a wide range of problems related to a quick change of the parameters of the PSS mode require a prompt resolution at the stage of operative or automatic control .

As evidenced by the results of the research, significant variations in loads on daily, weekly, and annual intervals cause wide limits of change in the probability characteristics of voltage. This causes insufficient reliability of the obtained results

and efficiency of energy management and the technical solutions made on their basis. Therefore, in relation to the PSS of cities, the load schedules of consumers, which are characterized by high heterogeneity, and a significant variation of the related probabilistic characteristics, further improvement of the methodological foundations of control of the modes of electric networks distribution is needed. The improvement should consider the variability of the probabilistic characteristics of the process at intervals of its repeatability in general. In addition, the results of the conducted analysis indicate the voltage regulation problem in the city's PSS and the impossibility of solving it within the existing concept of centralized regulation. To solve the problem mentioned at the current stage, it is necessary to improve the system, methodological and technical foundations of voltage regulation in the PSS of cities. To conclude, it should be mentioned that the main areas of solving the problem are considering the probabilistic nature of the change in regime parameters; considering the multi-criteria nature of the task; decentralization of the placement of the regime control tools; automation of the regulation process.

In general, the solution of the considered engineering problems in combination with a high-quality management of energy saving can ensure the sustainable development of territories even in the conditions of energy shortage.

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## **FEATURES OF AGGLOMERATIONS FORMATION AND DEVELOPMENT IN THE CONDITIONS OF POST-WAR CHALLENGES**

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World experience proves that the management of territories today faces new challenges and prospects. The developed countries of the world have a clear